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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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SMITH & HOPEN PA
15950 BAY VISTA DRIVE
SUITE 220
CLEARWATER, FL 33760

EXAMINER

TARCU, ROBERT

ART UNIT	PAPER NUMBER
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2623

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/089,266

Applicant(s)

KIM, MYUNG K.

Examiner

Robert Tarcu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-6 and 11-20 is/are rejected.
- 7) ☒ Claim(s) 2 and 7-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 03/25/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 11 is objected to because of the following informalities: The term "ad" in line 10 of noted claim. The Examiner assumes Applicant meant "and" instead of "ad." Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 18 recites the limitation " the magnifying means" in line 2. There is insufficient antecedent basis for this limitation in the claim. The claim appears to require both a means for magnifying and a magnifying means.

5. Further, it is unclear how the interference pattern can be positions between the magnifying means and the recording means.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 3-6, 11-17, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Measuring Shape and Deformation of Small Objects using Digital Holography to

Seebacher et al ("Seebacher") and Digital Holography: Methods and Applications to Kreis et al ("Kreis").

8. In claim 1, Seebacher illustrates a method for imaging a three-dimensional object comprising the steps of: [a] illuminating an object with radiation at a wavelength to form a reflected image beam (object wave; page 105, 1st Paragraph under *Digital Holography*); [b] providing a reference beam comprising the wavelength (reference wave; page 105, 1st Paragraph under *Digital Holography*); [c] recording an interference pattern between the reference beams and the image beam (page 105, 1st Paragraph under *Digital Holography*); repeating steps [a]-[c] at a succession of different wavelengths separated by a predetermined wavelength step; computing a holographic image from the interference pattern for each wavelength (page 111 under *Two-wavelength contouring*). Note, in this case different wavelengths were applied and thus, holograms were computed for each of the different wavelengths.

9. Seebacher fails to particularly point out adding the holographic images together to form an intensity distribution pattern.

10. Kreis, on the other hand, in an analogous environment, teaches of adding the holographic images together to form an intensity distribution pattern on the top of page 172. Note, Kreis mentions adding two digital holograms and reconstructing and evaluating their intensity. Figure 2 illustrates this.

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11. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Seebacher with those of Kreis. The skilled artisan would have been motivated to do so since such techniques allow effective applications in holographic metrology (Kreis, page 170 under *Applications*).

12. Regarding claim 3, Seebacher and Kreis' teachings can be found above in the discussion of claim 1. Further, Seebacher teaches of a method wherein the illuminating step comprising illuminating the object with coherent radiation (dye laser; page 110 Figure 13).

13. In claim 4, Seebacher and Kreis' teachings can be found above in the discussion of claim 3. Seebacher further discloses a method comprising the step of expanding the coherent radiation (dye laser) prior to the illuminating step (beam splitter; bottom of page 105 and page 106 Figure 3).

Note, Seebacher's dye laser passes through a splitter (as seen in Figure 3) before it actually illuminates the object.

14. In regards to claim 5, Seebacher and Kreis' teachings can be found above in the discussion of claim 1.

15. Both parties fail to specifically mention a method wherein the predetermined wavelength step comprises a function of an axial scale of the object.

16. The Examiner, however, takes official notice that it is known in the art that the spacing between the interference patterns is a function of the wavelength. Thus, if the spacing were too large for small objects, there would be no, or very few, interference lines covering the object.

17. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a minimum number of lines in order to ensure that smaller objects are properly covered by a sufficient number of lines.

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18. In claim 6, Seebacher and Kreis' teachings can be found above in the discussion of claim 1. Seebacher further recites a method further comprising the step of subtracting a zero-order intensity from each computed holographic image prior to the adding step (top of page 107 and Figure 5).

19. Regarding claim 11, Seebacher teaches of a system for imaging a three-dimensional object comprising: [a] illumination means tunable between a first wavelength and a second wavelength (page 109 1st Paragraph); [b] means for splitting radiation from the illumination means into an object beam and a reference beam (beam splitter; bottom of page 105 and page 106 Figure 3. Note, the dye laser is split into an object wave and into a reference wave.); [c] means for directing the object beam to illuminate an object desired to be imaged to form an image beam (page 106 Figure 3); [d] means for recording an interference pattern between the reference beam and the image beam (page 105, 1st Paragraph under *Digital Holography*); [e] means for computing a holographic image from the interference pattern for the first and the second wavelength (page 111 under *Two-wavelength contouring*) Note, in this case different wavelengths were applied and thus, holograms were computed for each of the different wavelengths.

20. Seebacher fails to specifically disclose [f] means for adding the holographic images together to form an intensity distribution pattern.

21. Kreis, on the other hand, in an analogous environment, teaches of [f] means for adding the holographic images together to form an intensity distribution pattern on the top of page 172. Note, Kreis mentions adding two digital holograms and reconstructing and evaluating their intensity.

Figure 2 illustrates this.

22. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Seebacher with those of Kreis. The skilled artisan

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would have been motivated to do so since such techniques allow effective applications in holographic metrology (Kreis, page 170 under *Applications*).

23. Regarding claim 12, Seebacher and Kreis' teachings can be found above in the discussion of claim 11. Further, Seebacher teaches of a system wherein the illumination means comprises a source of coherent radiation (dye laser; page 110 Figure 13).

24. In claim 13, Seebacher and Kreis' teachings can be found above in the discussion of claim 12. Seebacher further discloses a system wherein the radiation source comprises a ring dye laser (page 110 Figure 13).

25. In regards to claim 14, Seebacher and Kreis' teachings can be found above in the discussion of claim 11.

26. Both parties fail to specifically mention a system comprising means for magnifying radiation from the illumination means prior to the splitting means.

27. It is inherent that when a beam is split, intensity is reduced in the split beam. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to magnify radiation first in order to return the beam to its full intensity. It would have further been obvious to place the magnifying means before the splitting means, since this would only require one magnifier. The skilled artisan would have been motivated to do so in order to reduce the cost of extra magnifying means for his or her system.

28. In regards to claim 15, Seebacher and Kreis' teachings can be found above in the discussion of claim 11. Seebacher discloses a system further comprising means for aperturing the object beam (dye laser) to a desired area (fiber coupler; page 109 Figure 10).

29. In regards to claim 16, Seebacher and Kreis' teachings can be found above in the discussion of claim 15. Further, Seebacher teaches of a system wherein the desired area comprises an area

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substantially equal to an area of the object desired to be imaged (page 109 Figure 10). Note, the wave is substantially equal to the object.

30. In regards to claim 17, Seebacher and Kreis' teachings can be found above in the discussion of claim 11. Seebacher shows a system wherein the recording means comprises at least one of a digital camera or a charge-coupled-device array (page 105, 4th Paragraph under *Digital Holography*).

31. For claim 20, Seebacher and Kreis' teachings can be found above in the discussion of claim 11. Seebacher shows a system further comprising means for combining the reference beam and the image beam to form the interference pattern there between (page 105, 1st Paragraph under *Digital Holography*).

32. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Seebacher and Kreis as applied to claim 11 above, and further in view of U.S. Patent 6,262,818 to Cuche et al ("Cuche").

33. Seebacher and Kreis both fail to specifically mention a system further comprising means for magnifying the interference pattern positioned between the magnifying means and the recording means.

34. Cuche, in an analogous environment, teaches of a system further comprising means for magnifying the interference pattern positioned between the magnifying means and the recording means (column 3 lines 18-19).

35. It would have thus been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Cuche with those of Seebacher and Kreis. One would have been motivated to do so in order to create a larger image.

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36. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Seebacher and Kreis as applied to claim 11 above, and further in view of U.S. Patent 6,512,385 to Pfaff et al ("Pfaff").

37. Seebacher and Kreis both fail to specifically mention a system further comprising a first neutral-density filter positioned to filter the radiation between the illumination means and the splitting means.

38. Pfaff, in an analogous environment, teaches of a system further comprising a first neutral-density filter positioned to filter the radiation between the illumination means and the splitting means (column 7 lines 36-39 and Figure 5A). Note, Figure 5A shows the filter positions between the illumination means and the splitting means.

39. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Seebacher and Kreis with Pfaff. The skilled artisan would benefit from adding such a filter since it permits convenient adjustment of the laser power level (Pfaff; column 7 lines 38-39).

Allowable Subject Matter

40. Claims 2, and 7-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

41. Claim 2 discloses the limitation of “extracting out a series of two-dimensional cross-sectional images from the intensity distribution pattern,” which is allowable over prior art of record.

42. Claim 7’s limitations are allowable over prior art of record.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert Tarcu whose telephone number is (571) 272-8135. The examiner can normally be reached on M-F 8:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RT RT



MARK ZIMMERMAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600